Imports-economic growth nexus: ARDL approach to cointegration

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Imports-Economic Growth Nexus: ARDL Approach to Cointegration

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Abstract

This paper implements Auto-Regressive Distributed Lags (ARDL) to cointegration to explore long-run relation; and Granger procedure within Vector Error Correction Model (VECM) to test direction of causality between imports and economic growth for a sample of forty–ten each from high; upper-middle; lower-middle; and low-income–nations. We find long-run bidirectional causality in high-income nations except Japan. For others, we find mixed results ($M \Rightarrow GDP$ *or* $GDP \Rightarrow M$).

Key Words: Imports, ARDL

JEL Classification: O10

Introduction

The second-half of the twentieth century has witnessed the proliferation of a bourgeoning literature on the relation between trade-policy and economic growth. Despite disagreements over the direction of causation, evidence suggests that trade enhances economic growth. Some found exports cause economic growth [export-led-growth hypothesis (ELG); see Krishna et.al., (2003) for review]. Others found growth led by exports (GLE). Another group suggests that imports drive economic growth [import-led-growth (ILG)], something consistent with the endogenous-growth literature. From theoretical perspectives, imports of intermediate inputs and know-how help economic growth through technology transfer and foreign R&D spillover (Lawrence and Weinstein, 1999; Mazumdar, 2001). Various frameworks have been proposed to explain the differential rates of economic growth for otherwise similar nations. Models of open economy rooted in closed endogenous-growth models [Romer, 1986, Lucus,1988] have focused on the determinants of growth [see Barro et.al, 1995; Roubini et.al., 1995 for review].

Despite growing concerns over inequities in income distribution, the newly-industrialized economies have benefited from the externalities of liberal trade policy (Bhagwati et.al., 2002; Wacziarg, 2003; Spannu, 2003; Harrison, 1996). LDC's imports 85% of their machinery and transport equipment from the developed world which help economic growth [see Grossman and Helpman, 1991; Rivera-Batiz and Romer, 1993]. Edwards (1992) examines the relationship between trade orientation and trade distortions within

endogenous-growth model. "…(M)ore open economies grow faster because they are able to invest in imported machinery that is cheaper." (Mazumdar,2001, p.210).

According to the DeLong-Summers hypothesis, equipment investment is growth-enhancing. Imported foreign machineries are more efficient compared to their domestic counterparts [Coe and Helpman, 1995, Krishna et al. 2003, Mazumdar, 2001]. "Thus this literature seems to provide a theoretical foundation for the long held conviction among development economists that international trade, by providing essential and efficient foreign inputs for industrializing sector, is an important factor of economic growth" (Lee, 1995, p.92). Krueger (1985) notes, "…reduction in capital goods import would reduce the GDP growth rate and a reduction in intermediate goods and raw materials imports would adversely affect output and employment" (p.9). This research is motivated by the need to empirically further explore the ILG hypothesis, an important topic in the contemporary growth literature.

The objective of the paper is two-fold. First, explore a long-run relation between trade policy (import) and economic growth. We implement ARDL approach to cointegration which better suits small sample. Second, the Granger procedure within VECM is used to determine the direction of causality. This is important because if imports drive economic growth, policy should promote imports, and likewise for exports. If not, policy should focus on innovation, human capital, and other domestic policies. "One obvious way to address this issue empirically is to look for evidence on patterns of causality…the evidence…to date has been mixed" (Krishna et.al.,2003:p.482). The forty-sample nation

classified according to high, upper-middle, lower-middle and low-income groups[1] will help assess if the ILG hypothesis is related to the stage of economic growth. The paper contributes by providing further evidence to the imports-growth nexus.

Mishra et.al. (2009) found bi-directional causality and support for the ILG hypotheses for Pacific-Island nations. Awokuse's (2008) found mixed results for the ELG-ILG and GLE hypotheses for Argentina, Colombia and Peru; although support for ILG was relatively stronger (p.161). Thangavelu et.al.,(2004) found imports more relevant compared to exports for Asian economies. Granger causality runs from imports to productivity growth in India, Indonesia, Malaysia, the Philippines, Singapore and Taiwan. Mahadevan et.al., (2008) found no relation between economic growth and trade for Korea; but found support for ILG in Japan. Narayan et.al. (2007) could not reject ELG and ILG for Fiji, but found exports and GDP caused imports in Papua New-Guinea. Awokuse (2007) found that export and import impact growth in transition economies. Ramos (2001) failed to confirm unidirectional causality, but found feedback between exports-output growth and imports-output growth for Portugal. Although policymakers see trade openness critical for development, bidirectional causality between trade and growth is limited and elusive (Krishna, 2003).

The import-economic growth and FDI-economic growth nexus share some common features. The machinery and technological know-how brought by the multinationals/FDI is exogenously determined. By contrast, imports are policy determined. Foreign exchange is not a constraint with FDI, but relevant for imports.

[1]Krishna et.al. (2003) used similar categorization.

The rest of the paper is organized as: Section-2 outlines methodology. Section-3 reports results. Section-4 concludes.

2: Methodology

Data from World Development Indicator covers the period 1971-2006. Equation-1 specifies the imports-economic growth relation, expressed in logarithms.

$$LGDP_t = \varphi + \theta LM_t + \mu_t \quad ------(1)$$

where, μ is an error term; LGDP measures economic growth, and LM represents imports growth, both in real terms.

2.1: ARDL Cointegration

We implement ARDL approach to cointegration (Pesaran et al., 2001) to explore long-run relation between Imports and GDP for 40 nations, 10 each from high, upper-middle, lower–middle and low-income; and VECM for the direction of causality.

$$\Delta(LGDP)_t = \lambda_0 + \sum_{i=0}^{n} \lambda_i \Delta(LGDP)_{t-i} + \sum_{i=0}^{n} \lambda_i \Delta(LM)_{t-i} + \alpha_1 LGDP_{t-1} + \alpha_2 LM_{t-1} + \nu_{1t} \quad \ldots (2)$$

Following Pesaran *et al.* (2001) we test the null hypothesis $\langle H_0 = \alpha_1 = \alpha_2 = 0 \rangle$, denoted by $F_{GDP}\langle LGDP \mid LM \rangle$. Rejecting the null confirms a long run relation. v_{it} represents error term

3: Results

The ADF test shows both variables are I(1), difference stationary (results not reported). Based on SBC, lag-length 2 is selected. Long-run relationship between imports and GDP holds for all high-income-countries with bidirectional causality, except Japan where the causality is bidirectional in the short run.

Table-1 here

For the upper-middle-income countries (Table-2) two-way causality is found except Argentina, Botswana, Costa Rica, Hungary, Mexico and Poland. Imports impact long-run economic growth for Malaysia, Chile, Costa Rica and Mexico with positive elasticities. Brazil's economic growth is negatively impacted by imports in the long-run. For Argentina short-run causality exists. Imports cause economic growth in long-run for Botswana, with short-run bidirectional causality. In Hungary, economic growth causes imports in the short-run but the long-run causality runs from import to economic growth. The reverse is true for case of Costa Rica. Unidirectional causality runs from imports to economic growth for Mexico in long and short-run.

Table-2 here

Table-3 reports imports-economic growth causality for lower-middle-income nations. For Algeria, Colombia, Sri-Lanka, Ecuador, Indonesia, and Philippines, the causality is bidirectional in the long and the short-runs. In Thailand, Swaziland and Tunisia the short-run causality is bidirectional. For Egypt, imports cause economic growth in the long-run.

Table-3 here

Table-4 presents results for low-income nations. For Pakistan, Zambia, Chad, causality is bidirectional. For India, imports cause economic growth in long-run. Short-run causality

is bidirectional for India and Nigeria. For Central-African Republic, long-run causality flows from imports to growth. For Bangladesh and Ghana, the short-run causality is bidirectional but economic growth causes imports in the long run.

Table-4 here

4: Conclusion

The paper provides further evidence on the ILG hypothesis by exploring cointegration between imports and economic growth for 40 nations. Results support bidirectional $(M \leftrightarrow GDP)$ causality for high-income nations except Japan. The ILG hypothesis seems to favor the developed nations because they import according to their need. No clear pattern emerges for others. The long-run relationship holds for the majority. Absorptive capacity and lack of technological and organizational know-how might explain such differences. Further studies might add interesting insight.

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Table-1:High-Income-Countries

ARDL results			VECM results		
Countries	F-Statistic[2]	Coefficient-LM	LGDP-to-LM	LM-to-LGDP	ECT_{t-1}
USA	5.47**	0.74	25.06**		-0.15***
				40.8*	-0.06**
UK	33.33***	0.71		37.86***	-0.25*
			42.35***		-0.29
Japan	3.81**	0.35		4.49**	-0.14
			5.09**	-	-0.25*
Korea	44.07***	0.68***		51.01***	-0.22**
			49.69***		-0.29**
Finland	35.85***	0.73*		46.39***	-0.01**
			40.55***		-0.25*
Sweden	19.88***	0.81*		20.78***	-0.34**
			21.99***		-0.25*
Iceland	41.78***	0.76**		47.58***	-0.25**
			99.31***		-0.14**
Norway	25.65***	0.61**		28.48***	-0.23*
			24.92**		-0.58
Canada	11.19***	0.48**		13.31***	-0.16*
			12.19***		-0.15*
Italy	8.46**	0.59*		14.93***	-0.22*
			11.06*		-0.20*

Note: asterisk *, **, *** show significance at 1%, 5% and 10% significance level.

[2]Critical values 1,5 and 10% respectively, Lower-upper bounds:5.59-6.33;3.94-4.52;3.21-3.73

Table-2:Upper-Middle-Income-Countries

ARDL results			VECM results		
Countries	F-Statistic	Coefficient-LM	LGDP-to-LM	LM-to-LGDP	ECT_{t-1}
Malaysia	8.07***	0.68**	48.03***		-0.38***
				46.08***	-0.49***
S.Africa	2.69		47.05***		-0.27**
				38.87***	-0.23**
Brazil	4.06*.	-0.06***	4.73**		-0.22**
				4.46**	-0.11*
Argentina	2.30		35.54***		-0.08
				36.78***	0.21
Chile	8.96***	0.84**	1.69		-0.37**
				62.38***	-0.46**
Botswana	1.31		54.05***		-0.24**
				56.82***	-0.09
Costa Rica	3.16**	0.81**	18.68***		-0.13
				19.01***	-0.28**
Hungary	1.91		2.08*		-0.05
				0.51	-0.14*
Mexico	2.24**	0.65***	32.35		-0.06
				32.33***	-0.29*
Poland	0.94		0.77		-0.24**
				0.02	-0.08

Table-3:Lower-Middle-Income-Countries

ARDL results			VECM results		
Countries	F-Statistic	Coefficient-LM	LGDP-to-LM	LM-to-LGDP	ECT_{t-1}
Algeria	3.96**	0.43*	12.75***		-0.49***
				14.36***	-0.25***
Thailand	1.16		31.38***		-0.11
				25.44***	-0.16
Colombia	4.73**.	0.63*	50.65***		-0.18*
				49.38***	-0.19**
Ecuador	4.73**	0.61***	31.89***		-0.44***
				28.6***	-0.39***
Egypt	2.46		0.26		-0.33
				1.44	-0.16***
Indonesia	4.08*	0.84*	35.23***		-0.38**
				31.69***	-0.66***
SriLanka	4.02*	0.49*	18.53***		-0.38***
				14.66***	-0.29**
Philippines	4.02*	0.54**	33.65***		-0.16*
				28.24***	-0.21**
Swaziland	0.61		41.05***		-0.17
				41.52***	-0.13
Tunisia	2.14		73.51***		-0.96
				0.35	-0.59

Table-4:Low-Income-Countries

ARDL results			VECM results		
Countries	**F-Statistic**	**Coefficient-LM**	**LGDP-to-LM**	**LM-to-LGDP**	**ECT_{t-1}**
Pakistan	1.76		28.95***		-0.33**
				27.54***	-0.18*
India	0.96		17.78**		-0.17
				16.91***	-0.27**
Papua New Guinea	6.24**.	0.55**	6.42***		-0.02
				10.88***	-0.33***
Nepal	5.11**	0.49**	20.66***		-0.21*
				21.09***	-0.09
Nigeria	2.66		11.03***		-0.16
				7.06***	-0.02
Zambia	8.75***	0.93**	12.92**		-0.63**
				10.25***	-0.85***
Bangladesh	0.11		13.78***		-0.06
				12.34***	-0.59*
Central-African Republic	2.95		9.57***		-0.31*
				9.65***	-0.14
Chad	9.79***	0.21*	4.61**		-0.54**
				4.78**	-0.58***
Ghana	2.12		3.87**		-0.14
				4.18**	-0.20***